



Reductive Transformations of CO₂ and Lignin Using Molecular Catalysts

T. Cantat

► To cite this version:

T. Cantat. Reductive Transformations of CO₂ and Lignin Using Molecular Catalysts. GECCO 58 (Groupe d'Etudes en Chimie Organique), Aug 2017, Dinard, France. cea-02341625

HAL Id: cea-02341625

<https://cea.hal.science/cea-02341625>

Submitted on 31 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Reductive Transformations of CO₂ and Lignin Using Molecular Catalysts

Thibault CANTAT

NIMBE, CEA, CNRS, Université Paris-Saclay, 91191 Gif-sur-Yvette, France

[E-Mail : thibault.cantat@cea.fr](mailto:thibault.cantat@cea.fr)

Support informatique : PC

With 95 % of organic chemical commodities deriving from fossil resources, the chemical industry is currently exploring novel and renewable carbon feedstocks for the production of both bulk and fine chemicals.¹ In this context, the utilization of CO₂ or products derived from biomass wastes is an attractive strategy to access value-added products. Because these carbon sources feature carbon atoms in an oxidized state, the development of reduction methods is needed and they call for the design of efficient catalysts able to break strong C–O and C=O bonds.

Over the last years, our group has developed novel catalytic reactions for the conversion of CO₂ to formamides, N-heterocycles, methylamines and methanol, using hydroboranes, hydrosilanes or formic acid as reductants.²⁻⁹ In parallel, we have developed an unprecedented strategy to isolate simple aromatics, in a pure form, from natural lignin in 15 different wood species.⁹⁻¹⁰ These new catalytic transformations rely on the use of simple organocatalysts or Zn, Fe and Ru organometallic complexes. The mechanisms at play in these transformations will be presented, based on DFT calculations and isolation of reactive catalytic intermediates.

Références

1. Chauvier, C.; Cantat, T. *ACS Catal.*, **2017**, 7, 2107-2115.
2. Gomes, C. D.; Jacquet, O.; Villiers, C.; Thuery, P.; Ephritikhine, M.; Cantat, T. *Angew. Chem. Int. Ed.*, **2012**, 51, 187-190.
3. Jacquet, O.; Gomes, C. D.; Ephritikhine, M.; Cantat, T. *J. Am. Chem. Soc.*, **2012**, 134, 2934-2937.
4. Jacquet, O.; Frogneux, X.; Gomes, C. D.; Cantat, T. *Chem Sci*, **2013**, 4, 2127-2131.
5. Jacquet, O.; Gomes, C. D.; Ephritikhine, M.; Cantat, T. *ChemCatChem*, **2013**, 5, 117-122.
6. S. Savourey, G. Lefèvre, J.-C. Berthet, P. Thuéry, C. Genre, T. Cantat, *Angew. Chem. Int. Ed.*, **2014**, 53, 10466-10470.
7. E. Blondiaux, J. Pouessel, T. Cantat, *Angew. Chem. Int. Ed.*, **2014**, 53, 12186-12190.
8. Chauvier, C.; Tlili, A.; Gomes, C. D.; Thuéry, P.; Cantat, T. *Chem Sci*, **2015**, 6, 2938-2942.
9. Cantat T. *et al.*, Patent applications n° WO 2012/137152, PCT/IB2013/054601, PCT/IB2013/054599, PCT/IB2013/059304, PCT/IB2014/060356, PCT/IB2015/054567, PCT/IB2015/054570.
10. E. Feghali, G. Carrot, P. Thuéry, C. Genre, T. Cantat, *Energy Environ. Sci.*, **2015**, 8, 2734-2743.